CALTRANS DEPARTMENT OF TRANSPORTATION

PROJECT MANAGEMENT
PEER REVIEW

Bechtel Corporation

US Corps of Engineers

US Department of the Navy

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INTRODUCTION

PEER Group Review Process and Methodology

This PEER Review is undertaken as a joint public service effort by Bechtel Corporation, the US Corps of Engineers, and the US Department of the Navy. Our charter, as defined by Mr. James Van Loben Sels, Department Director, on October 23, 1992, was to investigate the sufficiency of Caltrans' implementation plan for project managment, evaluate the degree of implementation Statewide, and make any recommendations that might further this process. We were told we had complete freedom to go anywhere in Caltrans and make whatever recommendations we felt were appropriate. We were ably assisted in our efforts by the Project Management Systems Control Branch staff in Sacramento who provided invaluable guidence and assistance.

At the outset, the Project Management Systems Control Branch provided us with background information on the evolution of the project management process in Caltrans, departmental and district organization charts, Project Management Procedures Manual, Project Management Academy Manual, Project Management Control System (PMCS) Users Manual, and various presentation material and investigations undertaken in the past concerning the status of project management in Caltrans. All Peer Group members attended at least part of the Project Managers' Academy and Project Control Unit Forums.

To supplement this material, we prepared a lengthy questionnaire on the status of the project management process that was subsequently sent to over 600 Caltrans employees Statewide. Responses were received from 235 employees. A summary of the conclusions derived from their reponses is included in this PEER Review Final Report.

In addition, the PEER Group interviewed individually the majority of districts, the Office of Structures, Central Design, and Consultant Services about their experiences, successes and failures with the project management process. These interviews usually lasted about four hours. District and departmental management and employees were interviewed separately in groups. The minutes of these interviews are attached to this Report.

All of the above mentioned material was used in varying degrees to prepare this Report. It is a great deal of information, however, that really justifies more time than we had to evaluate it. We trust that you will carry on where we left off. We hope that what we were able to do and the conclusions we have reached will support your efforts to implement the project management process in Caltrans. A schedule of all of the activities performed by the PEER Group to prepare this Report follows.

We again want to thank everyone in the Project Management Systems Control Branch for their enthusiasm and support without which this Report would not have been possible.

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Schedule 1

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BECHTEL CORPORATION

Bechtel is a privately owned and managed corporation specializing in engineering and management services to develop, engineer, build, and operate a broad spectrum of transportation and industrial facilities and infrastructure. From its beginnings in 1898 with construction of the railroad across Oklahoma territory, Bechtel has grown into one of the largest and most experienced engineering, construction, project management, and construction management firms in the world. Today Bechtel's permanent staff numbers more than 20,000 employees, with a technical and professional staff of over 11,000. The firm is currently working on approximately 1,650 projects in 90 countries. In 1991 the Engineering News Record ranked Bechtel as the No. 1 transportation engineering and construction firm in a survey of the top 250 international contractors.

The Transportation Group within the Bechtel Corporation responsible for transportation and other infrastructure projects is staffed by over 2,300 specialists, of whom more than 1,000 have recent experience in highways, bridges, tunnels, railroads, heavy and light rail rapid transit, people mover systems, ports, and airports.

A recognized world leader in the engineering and construction of complex transportation projects, Bechtel's accomplishments through the years include:

- Over 17,000 miles of highways and roads
- 55 large bridges
- Over 2,100 miles of railroads
- 13 modern rapid transit systems
- 63 airports
- 80 port and harbor projects

Services provided by Bechtel for the transportation industry include preliminary planning, environmental analysis, geotechnical investigation, hydraulic design, highway and bridge design, cost control, scheduling, procurement, construction, construction management and start-up support. Bechtel personnel cover the full range of technical disciplines required to provide these services.

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THOMAS (TOM) R. LAMMERS, P.E. ***Bechtel***

Education
B.S., Civil Engineering, University of California

Professional Data
Professional Engineer in California and Arizona
American Society of Civil Engineers; American Public Works Association

Key Qualifications

Mr. Lammers is Bechtel's Manager of Highway Projects. He has 30 years of highway design and construction experience in key management positions with Caltrans, the Arizona Department of Transportation, and Bechtel. He was District Director of District 4 (Bay Area) and Deputy District Engineer of District 7 (LA) for Caltrans. Mr. Lammers was also head of the Arizona Highway Department. Presently he is in charge of Bechtel's Highway, Tunnel and Bridge Department.

Relevant Experience

MANAGER OF HIGHWAY PROJECTS, BECHTEL CORPORATION - Responsibility for liaison and home office support for all highway, bridge, and tunnel projects worldwide. Ongoing projects include the Ankara-Gerede Motorway in Turkey, the Boston Central Artery/Third Harbor Tunnel in Massachusetts, the Santa Clara County and Riverside County highway improvement programs in California, and the Richmond Parkway.

CALIFORNIA DEPARTMENT OF TRANSPORTATION - His 30-year career covered all aspects of programming, planning, design and construction of multi-purpose projects. As the District Director of District 4 (San Francisco) he was responsible for all Caltrans activities including those related to the location, construction, and agreement for the Bay Area Rapid Transit Project to occupy the median of the Route 24 freeway. As District Director he successfully concluded the negotiations between Caltrans and the Southern Pacific Transportation Company for Caltrans to finance the operation of Caltrain (the San Jose - San Francisco commute line).

CALIFORNIA DEPARTMENT OF TRANSPORTATION - As Deputy District Engineer, District 7 (Los Angeles) in charge of the planning and preliminary design of the Century Freeway. During this time the concepts were developed to allow for future transit to utilize the freeway median. He also managed Caltrans effort, working with the Southern California Rapid Transit District, to develop the design and reach the necessary agreement for the El Monte busway in the median and right-of-way on the San Bernardino Freeway.

INTRODUCTION

MICHAEL K. DAMSGAARD, P.E. ***Bechtel***

Education
B.S., Civil Engineering, University of Pacific, Stockton, California
M.B.A., Business Finance, California State University, San Jose, California

Professional Data
Licensed Professional Engineer, Illinois

Key Qualifications

Mr. Damsgaard has over 20 years of experience in project management, project cost and schedule controls, management information, and contract administration activities on a wide range of projects including highways, airports, dams, power plants and an LPG Plant.

Relevant Experience

CALIFORNIA DEPARTMENT OF TRANSPORTATION - Mr. Damsgaard was Project Manager responsible to assist the California Department of Transportation to implement a system of project management in District 4. Mr. Damsgaard supervised a team of twelve Bechtel employees who helped to develop generic schedules spanning the entire Caltrans project planning and design development process; project work plans; project management procedures and guidelines; and a 15-class training program in the project management process to over 200 District employees.

Mr. Damsgaard also assisted the Caltrans Headquarters Capital Support Management group to implement project management services Statewide. Mr. Damsgaard also acted as Consultant Coordinator for the Santa Clara Traffic Authority Measure A program responsible for the formulation, evaluation, award, control and coordination efforts for all design consultants associated with the conversion of Route 237 into a limited access freeway.

PROJECT CONTROLS - Mr. Damsgaard has performed cost and schedule control and contract administration activities on the Disney-MGM Studio Tour Project in Orlando, Florida, the Taipei Metropolitan Rapid Transit in Taiwan, the Jeddah International Airport in Saudi Arabia, the KOC Gas Gathering and LPG Plant Project in Kuwait, the Guri Dam Expansion in Venezuela, and on various domestic nuclear and fossil fueled power plants.

MANAGEMENT INFORMATION - Mr. Damsgaard was Manager of Financial Reporting for the BCIV Division responsible for supervising the group tasked with the accumulation, evaluation and reporting of all firm work, prospective work and overhead to senior management; and for preparing the financial portion of the Division Operating Plan.

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U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

The Sacramento District is one of three districts within the South Pacific Division headquartered in San Francisco. The District's geographic area is among the largest in the Corps and includes parts of eight western states, covering more than one-half million square miles. The District workload including Civil Works and Military Construction averages about $350 million annually.

The District is headquartered at 1325 J Street, just a few blocks from California's State Capital. About 850 of 1,200 employees are located in the District Office or in near-by satellite offices. In addition, there are four area offices and eight resident offices. These are the Central Area Office comprised of the Sacramento Resident Office and McClellan Resident Office; the Peninsula Area Office comprised of the Bay Resident Office and the Monterey Resident Office; the Utah Area Office comprised of the Hill Air Force Base Resident Office, Little Dell Resident Office, and South Utah Resident Office; and the Valley Resident Office. There are also two small regulatory field offices in Salt Lake City, Utah and Grand Junction, Colorado. There are also about 170 employees located at our 12 lake and river projects.

CIVIL WORKS ACTIVITIES

The Sacramento District's Civil Works primary mission includes the development and maintenance of flood control and navigation resources at the request of the public and Congress. These projects involve construction of levees, channels, storage reservoirs, flood proofing, and bank protection. Most of the storage reservoir projects are multi-purpose providing for flood control, and increases in water supplies for irrigation and municipal and industrial uses, water quality control, hydro-electric power generation, enhancement of fish and wildlife resources, and recreation opportunities. The District also provides emergency disaster assistance, regulatory control over navigable waters, flood plain information, flood control operation assistance of non-Federal reservoirs, and oversight assistance to the Environmental Protection Agency for the design and construction of waste treatment plants.

MILITARY ACTIVITIES

The military mission includes design and construction of facilities on 20 Army and 14 Air Force Bases in California, Nevada, Utah, and Arizona. Also, at the request of NASA, the District performs design and construction work in support of the space shuttle program.

Military work is diversified and includes projects such as hazardous and toxic waste removal, family housing, conforming storage facilities, recreational facilities, warehouses, hospitals, sewage treatment plants, runways, power plants, and specialized building for exotic training, equipment, and space-age weaponry. Projects undertaken by the District range from less than $1 million to over $100 million, although the average is between $3 to $7 million.

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JOHN P. SAIA, P.E. ***Corps***

Education
B.S., Civil Engineering, University of Miami, Florida
M.S., Civil Engineering, University of California, Sacramento

Professional Data
Professional Engineer in California
American Society of Civil Engineers
American Society of Military Engineers

Key Qualifications

Mr. Saia is the Deputy District Engineer for Project Management/Chief, Programs and Project Management Division, Sacramento District, U.S. Army Corps of Engineers. He has 24 years of experience in the Corps in programs and project management:

- Developed and taught programs and project management courses
- Wrote Project Management Manual
- Lead Headquarters (Washington DC) teams on project management automated system development and work breakdown structure
- Member of Headquarters Project Management Field Technical Advisory Group (PM-FTAG)
- Chair of PM Education Committee (PM-FTAG)

Relevant Experience

APRIL 1988-PRESENT. DEPUTY DISTRICT ENGINEER (CHIEF) FOR PROJECT MANAGEMENT, PROGRAMS AND PROJECT MANAGEMENT DIVISION. Responsible for establishing and implementing a new organizational division based on the Life Cycle Project Management concept: define operating procedures and personnel duties, select staff, establish policies, make recommendations to the District Engineer on funding and budgets, conduct Project Review Board, supervise staff including project and program managers, and work directly with project sponsors and Corps customers. Negotiate cost sharing agreements with sponsors. Act as liaison between U.S. Congressional staff members and U.S. Army Corps of Engineers South Pacific Division and in Washington, D.C. Headquarters. Administer annual project budgets of over $300 million with projects ranging up to $1 billion.

JUNE 1980-1988. CHIEF, PROGRAMS MANAGEMENT OFFICE. Established management procedures for projects involving flood control, navigation, hydropower, recreation, water supply and military construction. Developed annual and projected future manpower requirements in response to Congressional inquiries. Prioritized project execution. Responsible for submission of the Congressional Budget Requests and for management of funds and schedules of a $150 million program.

INTRODUCTION

NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST DIVISION

The Southwest Division is responsible for the planning, design and acquisition of facilities for the Navy, Marine Corps, other services, and federal agencies. The Southwest Division currently consists of 585 civilians and 51 military officers who work at 1220 Pacific Highway and at 13 offices located in Barstow, Bridgeport, Coronado, El Centro, El Toro, Long Beach, Miramar, North Bay, Pendleton, South Bay, 29 Palms, and Yuma, and at the Tustin relocation office.

The 1992 Fiscal Year Military Construction Program consists of 26 projects valued at $135 million, 85% of which should be awarded by the end of the calendar year. The total construction work-in-place will be $49 million; the total amount of design (DIP), $546 million. The non-income bearing O&MN is planned at $178 million.

The Southwest Division is also responsible to acquire and dispose of real estate for Navy and Marine Corps activities which own more than 267,000 acres of land just in San Diego County alone. The total facilities investment (Class I and Class II property) consists of a book value of $4.6 billion and a current value of nearly $13 billion.

The Southwest Division also provides:

- Programs and technical expertise to assist customers in compliance with natural resource laws and requirements, promoting stewardship of natural resources by managing endangered plant and animal species programs and administering the wetands program.
- Technical advice and assistance on the maintenance and operation of facilities.
- Navy and Marine Corps customer commands environmental compliance support by offering technical and contract assistance.
- Management of the Installation Restoration Program to reduce the contamination from past waste disposal practices.
- Management of central environmental funding programs including the FH93 $70 million Defense Environmental Restoration Account and $19 million Pollution Abatement Program.

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INTRODUCTION

CHARLES L. BALDWIN *Navy*

Education
B.A., Environmental Design, Rhode Island School of Design, Providence, RI
B.S., Architecture, Rhode Island School of Design, Providence, RI

Professional Data
Registered Architect, Rhode Island

Key Qualifications

Mr. Baldwin has over 20 years experience in management of major military projects, design of major commercial and residential buildings, and contract administration on a wide range of projects encompassing all engineering disciplines.

Relevant Experience

U.S. NAVY, SOUTHWEST DIV, NAVAL FACILITIES ENGINEERING COMMAND - Mr. Baldwin is currently Chief, Waterfront Project Management Section, with responsibility for all Navy Major Construction Projects serving Surface Forces in the Southern California Area and all major Non-Appropriated Fund Projects on the West Coast. The Waterfront Project Team manages 162 projects from design authorization through construction completion.

U.S. ARMY, 21st TAACOM, GERMANY - As Chief of Special Projects, Engineering Division, Mr. Baldwin led development of a project controls system for all Operations and Maintenance, NATO, and environmental projects for eleven military communities and over forty installations in four countries. The system automated project prioritization, contracting and construction milestones, as well as financial close-out information, improving project delivery significantly.

U.S. ARMY, CORPS OF ENGINEERS, EUROPE DIVISION - Mr. Baldwin managed a series of security projects in support of the Pershing missile system in Europe valued at over $65 million at multiple sites. Projects were developed from the pre-programming phase through construction contract award in less than 20 months. Projects involved sensitive international negotiation and were accomplished by multiple A-E contracts with U.S. and host nation firms.

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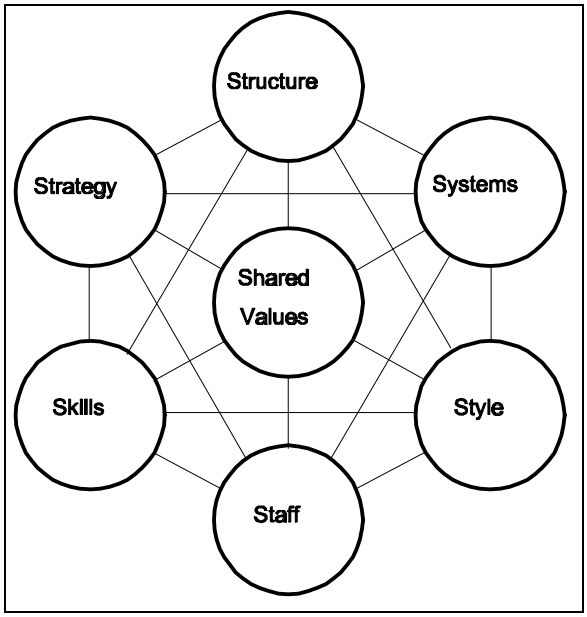
PEER Group Report Structure

The Seven-S (7-S) Model has been chosen to examine the implementation of the project management process in Caltrans. The 7-S Model was developed by McKinsey & Company to help assess the complex interrelationships that influence the effective operation of large organizations. This model was used successfully by the Corps of Engineers in late 1991 to evaluate the effectiveness of their recently implemented project management system.

Basic Model

The 7-S model is a conceptual tool for creating, evaluating, and guiding effective change. It consists of seven elements, each of which begins with the letter "S": Shared Values, Strategy, Structure, Systems, Skills, Style, and Staff. Each element is interconnected with all other elements.



This model stresses the interdependency of organizational and human factors. For a major change to be successfully implemented, all factors must be considered.

Shared Values

Significant meaning or concepts that are held sacred and essential to the organization's existence and purpose. Key to fitting all other components into a proper balance.

Strategy

Plan or course of action leading to the allocation of an organization's resources over time to reach its identified goals. The identified goals must be consistent with the organization's stated objectives and vision statement, and must consider both external and internal environments. The external environment addresses the relationships with local agencies, state and federal regulatory agencies, consultants, and the public; and the internal environment addresses the allocation of organizational assets and human resources to achieve its stated strategy.

Structure

Organizational structure including articulated departmental and employee responsibility and duty statements. The interrelationships and coordination required between co-existent production, functional and support services departments must be clear.

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Systems

Routinized processes, rewards, incentives, finances, information management, selection, evaluation, promotion, training, planning, communications, task measurements and reporting systems used by the organization to keep track of, and guide, its own activities.

Skills

Talents and abilities of the organization's employees. Skills are behavioral and can be observed, measured, and cataloged as the organization's talent base.

Style

Manner in which managers and employees work. A characterization of how management behaves in achieving the organization's goals.

Staff

Values, motivations and character of the employee and manager. Social/cultural/work ethic character of the organization.

An understanding of people, values and organizational dynamics is essential if change is to be managed effectively. Effective change will last only if it rewards and motivates the managers and employees who must carry it out.

Every organization must strive to achieve the proper balance of each of these seven elements. This 7-S model provides a formal structure to evaluate change in any organization so that no significant element is overlooked.

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SUMMARY

I. PROJECT MANAGEMENT IMPLEMENTATION STATUS

The implementation of project management, while not entirely successful, has focused attention on project delivery in the Department and Districts, identified both structural and procedural issues that constrain the project delivery process, marshalled a lot of resources to evaluate these constraints, and generally seems to be moving toward a new definition of project management particular to Caltrans. Employees are generally aware, interested, and supportive. **Both employees and management exhibit a strong desire to make project management work.**

II. CONCERNS

A. **Lack of realistic goals and objectives**. The definition of project management does not properly recognize the constraints placed upon the employee in civil service.

B. **Lack of communication**. The specific roles and responsibilities of all district employees in the project management process are not completely and uniformly understood.

C. **Lack of consistent management support**. Each district has different agendas for what they expect of Project Managers and Control Units, and how they hold them accountable for their actions.

D. **Lack of authority**. HQ micro-manages (over administers) district activity to such an extent that district accountability and responsibility is diminished. Consequently, the districts have very little authority to allocate to Project Managers.

E. **Lack of tools**. Project Managers don't have sufficient tools or procedures to know how their projects are progressing against plan except at gross summary levels. Functional Managers have no way of knowing what their workload is or how to plan for it.

SUMMARY

III. RECOMMENDATIONS

A. Goals and Objectives

1. Roles and Responsibilities

Project Manager. Establish the Project Manager's employee classification level as Senior in all districts. Permit other employee levels, however, if justified by the complexity and sensitivity of the project. Emphasize the Project Manager's "facilitator" role with responsibility to marshall district resources, monitor and expedite project activity, and identify critical issues for management's attention. Strengthen the present practice of obtaining functional support through mutual negotiation between the Project Manager and Functional Manager. Reinforce the Project Manager's accountability to the Supervising or Principal Engineer. Define the Project Manager's role during construction.

Control Units. Recognize that structural and procedural constraints, lack of career opportunities and ineffective project reporting systems limit the effectiveness of the Control Unit. Merge with Program Management. The Unit can be re-established once project reporting systems have been improved.

Program Management. Expand responsibilities to include support to the Project Managers to develop project budgets, monitor project progress and performance, and prepare project status reporting.

District Management. Specify district management responsibilities to support the Project Manager, Functional Manager, Control Unit, and Program Management, and to further the project management process.

2. Authority

Project Manager. Itemize the authorities the Project Manager does have. Emphasize the Project Manager's role in "facilitating" and "coordinating" the project development process, and in identifying conflicts and critical issues for management's attention.

Functional Manager. The Functional Manager provides a speccialized service to the Project Manager. Reiterate the Functional Manager's continued responsibility for quality. Emphasize the additional responsibilities for cost and schedule accountability, interface with the Project Manager, and obligation to surface conflicts and critical issues for management's attention.

3. Organization

There is no standardization between districts for function, functional grouping, organizational hierarchy, resource assignment, or identification coding. Develop stricter guidelines to standardize organizational elements and interrelationships within districts to facilitate interdepartmental transfers, interfaces with outside agencies, and the development of automated control and reporting systems. Ensure that Project Managers report directly to district management to strengthen independence and minimize bias.

4. Project Management Procedures Manual

The Project Management Procedures Manual should be rewritten in the active rather than passive voice. In addition, the Manual should be more specific in the following areas:

- Definition of the project management process in Caltrans. Discuss differences with the historical functional approach to project development. Emphasize partnership between scope, cost, schedule, and quality.

- Objectives of the project management process. Clarify the manner in which the effectiveness of the process is evaluated at both Advertisement and final installation. Emphasize the concept of "controllable" project events.

- Duty Statements for the Project Manager, Functional Manager, Control Unit, Program Management, and all senior district and HQ management. Describe how the roles vary during the planning, design, and construction phases of project development.

- Functional responsibilities and interrelationships of each project team member. (Utilize a functional/activity matrix where possible.)

- Relationships between the project, district management and HQ management.

- Interfaces with headquarters, other agencies, and the public.

- Allocation and control of project resources.

SUMMARY

- How a project scope, cost and schedule budget is developed.
- How formal commitments are obtained from Functional Units to participate in project development process .
- How project cost and schedule progress and performance are tracked against budget.
- How conflicts between scope, cost, schedule, resources and quality are resolved.
- Participation in consulting out selection and administration processes.
- A common work breakdown structure and description to be used for all Caltrans projects statewide.
- Project control tools and methods to be used to develop a project budget and to monitor it thereafter.
- Project reporting formats and timing for project control, and management oversight.

B. Communication

1. Academies and Forums

Besides continuing the present Project Manager Academy, the following additional academies and forums should be considered:

- **Project Managers Academy**. Expand the curriculum to include more front-end planning topics, and increase the attendance to include Functional Managers.
- **Project Controls Academy**. Focus on presenting reasoned overviews of project control procedures and methods to support projects and district management.
- **Project Managers Forum**. The intent is to share ideas and experiences of Project Managers throughout the State – a "lessons learned" Forum. Should also consider inviting members of local agencies and consultants for alternative opinion.
- **Project Controls Forum**. A "lessons learned" forum for project controls

(Program Management) personnel to identify and discuss common concerns, constraints, solutions, and successes.

2. Suggestion Programs

Institute a process and group in HQ to receive and act on suggestions from Project Managers, Functional Managers, Control Units or Program Management to improve the project delivery process.

C. Management Support

1. Continued emphasis

Continue participation in academies and producing project management newsletters to further advertise management's commitment to the project management process and improved project delivery. Insist that all project-related information and decisions include the Project Manager. Stress "project team" commitment and accountability to project delivery. Expand assignment of Project Managers to all projects – whether locally funded, TSM or minor projects.

2. Streamline delivery process

HQ should improve central support to the districts such as accounting, management reporting, resource allocation, procurement, and consulting out processes to further project development:

- **Accounting**. There is a lack of timely, responsive accounting records. The accounting system does not permit accountability down to the working element. Expended data are not available until 7 to 8 weeks after the fact. The present accounting system will not accept changes to correct errant charges. Codes of account are too numerous, redundant, inconsistent in terms of reported detail, and do not support current technology. The accounting system must be modified to produce both PY and cost expenditure data by source.

- **Procurement**. The procurement process is very cumbersome, often taking six months or longer to purchase minor items. Investigate means to loosen reins on districts. HQ should concentrate on strengthening procurement guidelines and focusing on overseeing the districts' conformance to these guidelines rather than micro-managing them.

- **Consultant Services**. The current consulting out selection and change order approval process routinely takes over 9 months to administer. This is too long and burdensome. The process is deep in inefficiencies, redundancy and misguided procedures. On-call consultant agreements are not used effectively. Consultant administration procedures should be strengthened.

- **Central Design and Office of Structures**. Many districts complained that these organizations could be improved if they were forced to implement the project management process as well. Districts had a difficult time assessing the status of their projects, expediting activities, evaluating quality or, in short, getting anyone in these organizations to recognize their needs or responsibility for project delivery.

3. Decentralization

HQ should investigate ways to pass on more accountability and responsibility to the districts; and the districts to the Project Manager. Areas to be investigated include more responsibility to approve scope, cost and schedule changes; involvement in the allocation of district PYs; more authority and freedom to procure needed equipment and supplies; and to select, advertise, amend and administer consultant contracts.

4. Develop tools

HQ should concentrate on developing better control tools, methods, procedures, management reporting formats, and training programs to support district activity. HQ should also take the lead in developing Caltrans specific software that has common application throughout the State. HQ should focus on establishing broad guidelines to assist the districts to choose appropriate project control hardware and software.

5. Employee Recognition

HQ and the districts should publicly acknowledge superior performance. Institute a program of "lessons-learned" to ensure superior performance is replicated. Institute an employee suggestion program and publicly acknowledge employee suggestions that improve working conditions, performance, and quality. Utilize "On-The-Spot Cash Awards", and "Certificates of Appreciation" as the Corps does to reward superior individual and team performance. Encourage Project Manager recognition of superior employee or team performance.

D. Tools

1. PYPSCAN

PYPSCAN and project management can co-exist but identified conflicts must be attended to first:

- There is a real need to revise PYPSCAN to retain its budgeting value. PYPSCAN algorithms must be modified to reflect current project development needs especially in the front-end planning processes.

- The PMCS database must be modified to be more receptive to project needs. Not everyone knows how to enter schedule commitments that go against pre-established lead times in the PMCS database. While PY allocations based on PYPSCAN allgorithms may be alright at the district level, PY allocations may be off by as much as a factor of two or more on any particular project. There is no way to correct initial PY allocations or to accommodate changes due to scope changes.

- PYPSCAN revisions directed by the project take up to 3 months to process before they are reflected in the PMCS database. Management reporting from PMCS is not sufficiently flexible or timely for project needs.

2. PYPSCAN Conversion Program ("Black Box")

The districts need more responsive and timely access to project information in the mainframe PMCS database whether it be from add-on software such as a "Black Box" or improvements to the existing PYPSCAN system.

3. Scope Change Control Program

Insist that a sound scope change control program be employed on all significant projects between PA&ED and Advertisement to ensure realistic schedules and cost estimates are prepared, management is kept properly abreast of project developments, and there are no cost or schedule surprises at Advertisement. All potential scope changes should be evaluated for cost and schedule impact on engineering, construction and maintenance.

4. Project Management Software

All Project Managers should organize and plan their development activities. All project team members should be a party to the plan. A good project management software facilitates this process. If Primavera is too complex or costly, a medium-end software such as Microsoft Project or TimeLine is just as effective and more user-friendly.

5. Workload Leveling

Project and functional management must get a handle on resource needs to compare against available workforce. This analysis will enable them to evaluate the sufficiency of existing workforce, arrange for support services when necessary in a timely fashion, or discuss leveling existing project delivery schedules.

IV. CONCERNS/RECOMMENDATION MATRIX

CONCERNS / RECOMMENDATIONS	II.A. Goals/ Objectives	II.B. Commun-ication	II.C. Mngmnt Support	II.D. Authority	II.E. Tools
III.A. Goals & Objectives					
1. Roles & Responsibilities	□	□	□	□	
2. Authority	□	□	□	□	
3. Organization	□	□	□	□	
4. Procedures	□	□	□	□	
III.B. Communication					
1. Academies		□	□		
2. Suggestion Program		□	□		
III.C. Management					
1. Support		□	□		
2. Delivery Process			□	□	□
3. Decentralization			□	□	
4. Tools	□	□	□		□
5. Recognition		□	□		
III.D. Tools	□	□	□		□

FINDINGS

STATED ELEMENTS OF THE PROJECT MANAGEMENT PROCESS IN CALTRANS

- Single individual responsible for project development from its inception to completion.
- Project delivery goals clearly defined and integrated in terms of scope, cost, schedule, and resources.
- Planning, monitoring and controlling all project efforts at the project level under the direction of the Project Manager.
- All project team members focused on project goals and objectives and held accountable for achieving them.
- All department and district organizations support the project management process.
- Non-project operations must not be compromised.

NOTE: The following narrative consists of the PEER Group's findings after review of all the materials made available to us, responses to the questionnaire, and district interviews. The frequent double-indented quotations are obtained from Caltrans personnel either extracted from their responses to the Questionnaire or from the meetings with district staff.

1. Shared Values Issues:

a. *What problems is the implementation of project management attempting to solve*?

Project Delivery

Appears to be wide-spread acceptance that project management is intended to improve the Department's ability to deliver projects within cost and schedule budgets.

> "Because of limited resources, it is imperative we have an efficient and accountable engineering team."

> "Everyone needs to understand that we are no longer the sole designers of highways, we now have to compete with private industry."

> "Times are changing ♘ we need to be leaders in responding to change ♘ its not the interstate era anymore!"

Project Management Objectives

Based on the Questionnaire and interviews, most employees feel they understand the concepts of the process, its methods and its objectives. Also based on the Questionnaire, its obvious that they don't. Most employees don't really understand what each other's roles are in the process. Most employees don't know how the project management concepts differ from what they were doing in the past. The "team" concept has not been established. There is no mutual focus on, and commitment to, project delivery as a shared cooperative objective.

> "Most Project Managers feel they barely have enough resources to deliver. The added effort to schedule, monitor, and update further burdens available resources."

Existing Culture

Caltrans employees believe they are performing ably within historic Caltrans' constraints. Poor delivery is generally believed to be caused by outside influences, or internal Caltrans constraints. One district felt project management was an insult; it implied they weren't doing all that they could do to deliver projects.

> "As an organization we are very good at discussing and evaluating and discussing and evaluating …. but not very good at implementing real organizational change."

b. *Is HQ's concept for project management widely understood and accepted?*

> "We who are interested in quality and take pride in our product cannot get used to just meeting dates!"

> "We put so much emphasis on the actual month of delivery, we lose sight of the effort, commitment and dedication our staff has put into the delivery of a project."

Each district has implemented project management in accordance with their

implementation plans initially prepared in December 1988 and later revised in September 1989. Each district's implementation efforts were monitored in terms of compliance with HQ's prescribed nineteen points. Each district has participated in numerous seminars, workshops and academies. Therefore, it is probably fair to say that all districts have a similar working knowledge of the goals, objectives and basic work processes of the project management process.

Whether they truly understand the implications of the project management process and the demands on the employee is doubtful because of historical working relationships and structural organizational constraints on the process:

- The basic tenet of project management that requires each project team member to be "accountable" for his/her assigned tasks is not widely practiced. Perhaps because this accountability was not required in the past, this has stressed the basic working relationships between employees. Younger Project Managers have fared better in this regard; more experienced Project Managers have low-keyed the accountability issues.

  "Some people do not like action items that they might be responsible for - 'I know how to do my job!'"

  "Usually no one takes action."

- The authority of the Project Manager is not extensive:

  - In some districts, the Project Manager is an Associate "coordinator" responsible to expedite project issues without the authority to dictate action.

  - In some districts, Project Managers have been chosen from employee classifications that suggest authority but, in practice, often result in a coordinator's role because of the lack of any other substantive authority.

- The responsibility of the Project Manager for <u>all</u> of the planning and design activities on the project is new to Caltrans, and Project Managers don't always grasp the larger scope of their role or are reluctant to exercise it. For example, Project Managers feel relatively powerless when dealing with Right of Way, Materials or the Office Engineer whose activities are generally dictated by prescribed lead times. Controversial issues are not being addressed because they are either "too" difficult or "the way it has always been".

  "There is no real cooperation from Functional Groups. It seems like every time their services are needed they "don't have time", "have too much work", "need overtime", or "need more time" than you have."

  "The employees are not resisting project management as much

as some of our management, especially functional management. They think the concept is in conflict with their responsibilities."

✂ Project Managers are having difficulty differentiating events and activities they can influence and those they cannot. Many conscientious Project Managers that attempt to coordinate and expedite their project activities, become frustrated by events that occur beyond their control.

"There are too many influences on project development. In theory, project management is fine but it just isn't practical for an outfit that reacts to political pressure or budget constraints."

✂ Many employees believe it is business as usual; that project management will pass in time.

"The project management process is basically fixing something that wasn't broke."

"PS&E will be delivered on time with or without project management. Construction will finish what Project Development didn't have time to do."

"There are so many Project Managers their authority is watered down. When the Branch Chiefs managed their projects they had adequate resources and could prioritize."

"Projects continue to be delivered in spite of project management!"

"Design modifications are made to ensure engineering integrity ✍ not for the convenience of design or construction schedules."

"Please remember, on complex projects scope evolves over time ✍ over-control can impede development of the best transportation solution."

"Too much emphasis on project delivery. Projects have been prevented from incorporating needed scope changes so that the project could be delivered on schedule."

"If they don't sign my time sheet, I don't have to do what they ask!"

c. *What is the difference between management's stated objectives of project management and what has been implemented?*

Project management is, and will be, effective when compared to the historical functional way of doing business in Caltrans because:

- More employees are uniformly focused on project objectives and actively seek to achieve them.
- There is one central source for project information who helps expedite and coordinate project activities.
- Senior management is putting a lot of emphasis and support behind the implementation of the project management process.
  - The concepts of cost and schedule are viewed as equal partners to quality.
  - Functional groups are (will be) better able to balance their workload.

To the extent project management is effective has less to do with the responsibility, authority and accountability centralized in the Project Manager, than the "facilitating" role played by the Project Manager. The Project Manager perpetuates a dialogue with team members concerning project cost and schedule objectives, actively seeks alternative solutions, expedites issues, and follows-up on action items.

While Project Managers have uniformly been assigned to projects, they don't uniformly take a hands-on, pro-active approach to project delivery, or ask the "tough" questions. Younger Project Managers show more enthusiasm for the process.

> "Separate Project Managers won't work because the bottom line is the ability to control resources and set priorities ☞ only HQ and district management have the authority to do that!"

Project controls is non-existent primarily because of the lack of support from central accounting, procurement and contracting out processes; comprehensive and pertinent controls procedures; an effective Project Controls Unit; and district management support. Younger employees with previous consultant experience are concerned at Caltrans' lack of project control and opportunities to exercise it. District management often emphasizes paper-trails at the expense of open and active project communication.

> "Forget the Control Units! Establish regional managers over Project Managers ☞ provide them with resources, authority and responsibility ☞ and stand back!"

> "I don't know what Control Units do or what there supposed to do!"

"It might be beneficial for control people to attend Project Status Meetings so they can help monitor schedules and costs."

"These people control nothing ✍ it is my experience that the Control Unit is more a data input/output resource."

"The Control Unit is doing work for everyone (especially top management) except Project Managers."

d. *Does the "Project Team" accept the role of the Project Manager?*

The Project Team responds to the Project Manager in accordance with the employee classification of the Project Manager. A Supervising TE or Senior can marshall the requisite respect and response to difficult issues.

"In our district, the Project Manager has been closed out of meetings with elected officials, Public Works Directors, tax measure members on items directly involving their projects."

"Our Project Managers are only assigned at the Senior level and they are not high enough to be effective."

Functional group members are reluctant to accept authority from other than their own Functional Managers. Functional Managers are reluctant to acknowledge the Project Manager's authority and see him/her in a coordinating role ✍ to respond to graciously until an issue arises. Smaller districts respond with similar grace and limitations.

"There has to be a plan and all Functional Groups must buy in. Functional Groups can't be told to produce without consideration of available time or resources."

"Our biggest problem is getting decision-making people (Functional Managers) to come to the meetings."

Because of the largely coordinating role of the Project Manager, the difficulties of the matrix organization and the stresses it imposes on the employee have not been addressed nor experienced to any great degree.

Outside agencies have no trouble adhering to the concept and authority of the Project Manager. They are accustomed to the process in the industry, it makes their life simpler to respond to one authority, and easier in the sense that project activities are better managed than they were in the past.

e. *How does management know when its project management goals and objectives are being met?*

- ✂ Normal project status reporting. An improvement in delivery from the historical standard is attributed to the project management process.

- ✂ HQ is also emphasizing a "war room" approach to monitor project cost and schedule delivery status against the delivery plan. Individual Project Managers are requested to explain deviations from plan to HQ management.

  - ✎ Pros: Focuses attention and accountability on project delivery. Tangible HQ support for district efforts to implement project management.

  - ✎ Cons: After the initial enthusiasm wanes, the war room may not be updated in a timely fashion and fall out of favor. Short term results are not necessarily a reflection on the project management process. HQ's efforts may dilute district management responsibility and accountability for project delivery. Information is often too late to avoid cost and schedule slippages.

- ✂ HQ periodically takes a poll of district opinion to test the effectiveness of the implementation process. HQ asks feedback from district personnel at various seminars and academies. Outside opinion is requested periodically through consultants, local agencies and peers via such mechanisms as this Peer Review which helps to maintain objectivity.

2. Strategy Issues:

a. *In terms of project management, when does a project begin and end?*

HQ has stated that the Project Manager's responsibilities begin at project conception and extend through construction. Generally, all districts appoint a Project Manager early in the planning stages. The Project Manager's role during construction is not as clear nor as universally accepted by all districts.

HQ wants the Project Manager to be responsible for construction just as he/she was responsible for the planning and design activities. Districts generally believe that the Project Manager should be responsible to interpret PS&E during construction; ensure mitigation commitments are met; help review the bases for change orders and claims; and oversee and coordinate design activities for changes during construction only; that the Resident Engineer should retain responsibility for all construction activity to simplify reporting relationships and avoid liabilities that may occur otherwise.

> "The number of CCOs could be substantially reduced if Project Managers were required to approve or at least concur with

the CCO prior to implementation."

b. *What projects should be managed by the project management process?*

It is generally agreed that all capital improvement projects should be managed by a Project Manager. Minor projects lasting no longer than one year or require the services of only one functional group do not require a Project Manager but rather a "Program" Manager. Locally funded and managed projects, and Transportation System Management Projects would be enhanced by a Project Manager tasked with coordinating and expediting planning and design activity.

Regardless of how projects are "managed", all projects should be tracked if workload is to be properly evaluated.

c. *Should project management be standardized within the Department? Within each district?*

> "Can we manage our program effectively when 12 districts are doing 12 different things? How do outsiders feel when dealing with different districts?"
>
> "Why isn't the Office of Structures required to implement project management?"

Each district has adapted to the project management process differently. This variation occurred for a number of reasons: to fit the needs of different project mixes, available resources, or the personalities and background of the district management personnel.

In those districts where Project Managers have been assigned at the Associate Engineering levels, they act primarily as project "coordinators". They are able to exact support from Functional seniors because of their personality and "rightness" of their cause. They have been successful.

In those districts where Project Manager's have been chosen at the Supervising Engineering level, there are instances where they act decisively, represent Caltrans with local agencies effectively, and often decide project issues against conventional wisdom if necessary to enhance project delivery. They are oftentimes responsible for more than 25 projects, however. Supervising Engineers are generally too removed from day-to-day project activities to have a real "project management" impact on project delivery. On the other hand, the Project Manager in these districts is assigned at the same employee classification level as the Functional Manager and, therefore, better able to negotiate as an equal.

Should the approach to project management be standardized in each district? No, for the

reasons stated, but there has to be certain similarities to accommodate personnel transfers and ensure a minimum level of effectiveness:

- ✂ Most Project Managers should be chosen from the Senior Transportation Engineer level. This assignment will accommodate most district dissimilarities and means that each Project Manager would oversee no more than nine projects and be more in control of day-to-day project activity. More senior district management could support the Project Manager as required at times when the employee classification level or experience is insufficient to get the job done. Supervising Transportation Engineers could be assigned as Project Managers on common corridor projects depending on the complexity, public sensitivity, and degree of direct participation required.

  "The complexity of the project should dictate the classification of the Project Manager. Allowing various levels (classifications) is an excellent motivational tool."

  "A Senior's authority in one district may be greatly different from a Senior's authority in another."

- ✂ The definition of project management as practiced in Caltrans be changed from the industry accepted definition to acknowledge the lack of experienced resources, numerous influences on project development outside the control of the project, lack of effective structural and motivational factors to stimulate and reward superior performance, and inability to grant adequate authority to Project Managers.

  This definition should stress the "coordinators" role of the Project Manager and lessen the emphasis on complete "control" over all planning and design activity; strengthen the Project Manager's accountability to the Supervising and Principal Engineer for project delivery in terms of responsibility to facilitate project development by marshalling and expediting district resources, monitoring project activity, and surfacing critical issues; and responsibility for directly supervising the design squads. This new definition would acknowledge the present practice of obtaining functional support by mutual negotiation between the Project Manager and Functional Manager. Disputes would be raised to the Supervising and Principal Engineer level for resolution. This new definition should address the Supervising and Principal Engineer's responsibility to support the Project Manager with resources and assistance as necessary.

- ✂ Project control tools, methods, procedures, management reporting formats and training programs should be developed and coordinated by HQ as a central support to all districts.

d. *Are allocated resources sufficient to effectively carry out the project management*

process?

Probably. While little additional resources were given to the districts to implement project management, the districts by and large were able to balance workloads such that Project Managers were able to fulfill their Project Manager role without detriment to their other activities. The cost and schedule support groups, however, were non-existent in the pre-Project Management organization and required more net resources to staff. Where the allocated resources were insufficient to staff these control groups, the districts had to draw resources from other sources which they apparently did without undue hardship.

It is also likely that the districts will become more efficient under the project management process which should more than offset additional time spent in meetings which has been the complaint of some.

> "Districts are adequately resourced within 1% variance of the workload. Whether the right units receive the resources is questionable."

e. *Can project cost and schedule delivery be improved by advertising with an incomplete design package?*

Caltrans has traditionally completed a 100% design package prior to advertisement thereby reducing the number of change orders received in the field. This may or may not be conducive to project delivery at the least cost and schedule.

Caltrans should consider the time value of money when evaluating whether the PS&E package should be slipped to incorporate additional changes. While HQ usually establishes escalation factors for the BEEs estimates, the districts should be required to prepare fully escalated estimates to recognize the cost impact of varying installation schedules on the final capital cost of the project.

On the other hand, current emphasis on achieving advertising dates may result in an insufficient design package going out to bid and an inordinate number of changes orders occurring during construction as a result. To ensure the Project Manager is not unduly motivated to put out an incomplete design package, the Project Manager should be measured not only on achieving cost and schedule delivery at Advertisement, but on final installed cost and schedule of the project.

> "A project we recently reviewed offers a benefit to the traveling public of $1.6 million/day. This amount would not just cover a lot of change order work but would suggest going to construction immediately and designing it during early construction."

f. *How can HQ best communicate and sell its philosophy to the districts? How can a State-wide commitment to the project management process be obtained?*

I think HQ has effectively transmitted its concern for project delivery to the districts, directed the implementation of the project management process in each district, and continually voiced its commitment to the process. While the districts may have felt the need to experiment with the manner of implementation, they have remained true to HQ's basic objective to improve project delivery by personalizing the project delivery process.

HQ can improve districts' commitment to the project management process by continuing to clarify employee functions and responsibilities; improving central support functions to the districts such as accounting, management reporting, resource allocation, procurement and consulting out processes; by devising project reporting formats that highlight deviations from plan, focus on broad project status parameters, and by requiring appropriate and comprehensive explanations for all deviations on a routine basis.

> "All Functional Groups need realistic workload factors and a method to balance workload through negotiation. However, this is a meaningless exercise when delivery schedules have already been established. The Project Manager must reach agreement with all impact functional units prior to establishing a final project schedule. District Directors must set delivery priorities when projects slip and potentially impact other project delivery commitments."

> "There is a need to have an incentive program and recognition for efforts beyond minimum standards. Many employees' goals and priorities are not those of the organization."

> "Until employee productivity and pride is increased, the Project Manager's job will be more difficult than it should be."

g. *What revisions to the current guidelines are necessary?*

Caltrans has had difficulty implementing project management because of the structural and procedural constraints civil service places on the project management process, inconsistent application of project management principals in each district, inadequate central support functions, and ineffective control units. Some guideline revisions are necessary to better address these issues:

- ✂ Definition of the project management process in Caltrans should be revised in accordance with Item 2.c.

- ✂ The employee classification levels for the Project Manager and Control Units should be standardized where feasible.

- ✂ Duty statements for the Associate Engineer, Senior Engineer, Resident Engineer, Project Manager, Functional Manager, Supervising Engineer and Principal Engineer from project inception through construction should be drafted to clarify roles and responsibilities throughout the State.

- ✂ Operating procedures should be revised to better address interrelationships, accountability and responsibility of the Project Manager, Control Unit, Functional Groups, and Program Management.

- ✂ Project control procedures should be revised to be more specific on the type of control tools, methods, procedures, and reporting formats to be employed on each project.

3. **Structure Issues:**

a. *Does the Project Manager have sufficient authority to carry out his/her responsibilities?*

> "A failing in the present process is that Project Managers have no authority over functional staff. Their only real power is in negotiation and persuasion."
>
> "Our Project Managers seem to be able to achieve their goals without the necessary authority. Does this mean they actually have sufficient authority, or that they are creative enough to get around this problem?"
>
> "Even though the Project Manager does not have direct authority, he always has the ability to elevate the problem to accomplish his goal. He also has enough authority to be innovative. I don't see enough of either being done. They haven't really changed the way they do business."

FINDINGS

Caltrans is structurally and organizationally constrained from permitting the Project Manager the freedom and responsibilities enjoyed in the private sector. Some organizational issues such as career path, rotation program, employee classification, registration requirements, authority over functional personnel, enforced top-down management rather than bottoms-up, and limitations on the Project Manager to authorize cost and schedule changes or reallocate and balance resources may be changed in time. Structural issues such as legislative, environmental and local agency accountability; county and city apportionment; funding constraints; and personnel administration policies will never go away and will forever govern the way Caltrans operates. Rather than frustrate the process and the involved employees, a revised definition of the role of the Project Manager should be drafted to recognize these constraints.

Real authority in Caltrans or any other government organization to hire and fire, compensate, or otherwise alter the course of events is limited. Project management has nonetheless been successful in government organizations (the Alameda Naval Air Base and the Corps of Engineers to name two) because they recognized two concepts: 1) individuals are innately motivated to produce a quality product if the means to produce that product are within their control, and 2) good performance must be reinforced to motivate the employee and propagate similar behavior throughout the organization.

In the Corps, authority is achieved by providing global funding allocation responsibility to the Project Manager who can administer, augment or otherwise alter the timing of funding and work assignments to the functional support groups. In Alameda, smaller work groups were established consistent with identifiable work products, minor competitions were created between competing work groups, quality was stressed, employee suggestion programs were established and rewarded for measurable improvements to production and performance, and work restrictions were eliminated wherever possible.

How can Caltrans benefit from these experiences? By appreciating that the issue of adequate authority and accountability is not new to Caltrans; that others in government service have had success employing novel solutions to these issues that fit their particular circumstances. Caltrans could investigate means to increase current authority by:

- ✂ Involving Project Managers in the PY allocation process within the district.
- ✂ Providing the Project Manager with some mechanism to allocate assigned project PYs to functional groups based on mutual negotiation
- ✂ Allowing the Project Manager to reallocate PYs between projects within his/her jurisdiction or by mutual consent between other Project Managers to better balance workload.
- ✂ Giving the Project Manager authority to consult-out for functional support as necessary to achieve project delivery with Functional group oversight determined by mutual consent.

- ✂ Publicly acknowledging superior performance in the districts and follow up with more challenging assignments State-wide for those that deserve it.

- ✂ Instituting a program so that superior performers are recognized by their peers (if not by classification or pay) such as a project management "lessons learned" forum in each district which could be lead by superior performers.

- ✂ Increasing ability to approve scope, cost and schedule changes.

- ✂ Instituting an employee suggestion program supported by senior management to publicly acknowledge employee suggestions that improve working conditions, performance and quality.

- ✂ Fostering an atmosphere that takes pride in producing quality products competitively with the private sector.

- ✂ Incorporating control systems (Engineering Control Systems that track progress and performance by individual drawing, and that monitor detailed design expenditures) to monitor design as sophisticated as those employed in the private sector (settle for nothing less).

- ✂ Implementing a performance monitoring program that uses common denominators or ratios to measure and compare PY expenditures rates for comparison to other Project Managers.

b. *What should be the role of the Project Manager at the district level? At the HQ level?*

The project management concept (one employee responsible to organize and manage complex, interrelated actions of others) should be applied wherever feasible in the district or Headquarters. Any work assignment, group of work assignments, or project could theoretically be assigned to a Project Manager. Furthermore, there is no reason why a Project Manager in Central Design shouldn't report to a Project Manager in the district, or a Consultant Manager shouldn't report to a Caltrans Contract Manager. What is important is the sphere of responsibility, not the title. Overlapping spheres of responsibility are common in the industry and require an implicit understanding and sensitivity to the limits of respective authorities; one manages a seconded employee much differently than one would a consultant.

c. *What should be the role of the functional support groups in the project management process?*

"Functional Managers continue to operate as before. The Project Manager doesn't have much authority, if any, over

the quality of products produced by the Functional Groups. If there is a problem, the Project Manager has to either compromise the design or do it with his own resources."

The functional support groups provide technical products to the project. They are organized to consolidate the requisite expertise and oversight to produce a quality product consistent with Caltrans standards in the allotted timeframe and budget. Functional support groups are accountable for the products they produce. They provide a channel for career advancement and development for those employees who wish to specialize.

At issue is whether functional employees should be assigned to work directly under the Project Manager or remain under the jurisdiction of the Functional Manager. In either case, the end product does not suffer; the Functional Manager retains direct responsibility for the product in one case and functional responsibility in the other. Whether a functional employee is deployed or not is really a function of the size of project, the task to be performed, and available experienced resources within the functional group. A combination of deployed and retained employees can co-exist without conflict.

A concern is the deployed employee's ability to deal with the dual reporting relationship to both the Functional Manager for technical guidance and clearance, and to the Project Manager for scope, cost and quality. There are overlapping spheres of responsibility that all parties must be sensitive to. Not all employees are able to adjust. All channels of communication should be encouraged and potential issues tabled for discussion to avoid conflict. Project management is <u>not</u> an autocratic process, it is a collaborative one. Senior management should be attentive to the difficulties.

d. *Do existing personnel policies complement the project management process?*

Some personnel policies are at odds with the project management process. Those that have come to our attention are:

- ✂ <u>Rotation program</u>:

  Employees move too quickly (every two years). The organization must be in a constant state of training which requires additional resources and a loss in productivity. Difficulty in training and keeping experienced users in Primavera, for example, may mean the software is dropped in favor of a more user-friendly, but less capable product.

- ✂ Registration:

  Registration is required for advancement in Caltrans although it is not absolutely necessary for Project Managers or Project Control Group employees to be effective in their respective roles.

- ✂ Career path:

  While there is no formal career path for a Project Managers, the position is a natural preparatory step to senior management. The career path for a Control Unit employee is less clear.

- ✂ Rule of three:

  Dictates supervisory thresholds which may have nothing to do with scope and breath of responsibility.

- ✂ Overtime:

  Often viewed as additional income rather than as a means to meet pressing deadlines.

e. *Are structural improvements in the delivery process, such as reducing review times, eliminating redundant effort and streamlining procedures, considered part of the project management process?*

The project management process focuses attention on project delivery. Any improvement in review times or eliminating redundant effort that improves project delivery is contributory to the project management process.

> "Right-of-Way should be empowered to contract for project appraisals without going through General Services."
>
> "The districts do not have adequate authority over Structures design. Structures is not accountable for their work!"
>
> "Functional Groups have too much fat in their standard lead times ✍ design is always having to make up for lost time."
>
> "Detailed design and right-of-way work should start before environmental clearance on some projects if the risks are acceptable."

An efficient project management program includes open communication and feedback between all parties. This acts as a self-correct mechanism to ensure focus remains on

delivery, helps to build teamwork, and improve morale.

f. *Is the relationship between project management and Program Management clear?*

"Program Management" or "Planning" appears to be slightly different in scope in each district but generally responsible for funding, delivery plan development, resource management, PYPSCAN updating, and district management and HQ reporting. Historically, Program Management was responsible for developing and monitoring "program" delivery. It did so through the PYPSCAN system which automatically developed project delivery schedules based on State-wide averages and broad project parameters. This is a top-down management system.
"Project management" is concerned, at least in theory, with project delivery. It requires a detailed cost and schedule plan, commitments from participants, and an active focus by the project team on executing the project within those constraints. Project budgets are developed and monitored at the project level. Summary status reports are prepared for management review and action if necessary. This is a bottoms-up management system.

As described, the distinction between the two groups is clear, although the objective of the PYPSCAN system and project management is not integrated. This looming conflict between top-down and bottoms-up management methods is discussed in more depth in the Systems section of this report.

A separate and distinct Project Control Group has been developed in most districts to help Project Managers prepare budgets and monitor project progress and performance during the project development process. The initial reasoning behind this group separation was to emphasize and oversee the implementation of a "new" and taxing discipline, and two, to remain independent from the historical organizational relationships.

Some districts have combined the Project Control Group and Program Management activities into one group. The genesis for this move may have been the difficulty with training, and retaining a Project Controls Group. It may have stemmed from the difficulties the Project Control Groups have in participating pro-actively in the project control process.

While smaller districts may not view this as a concern, this combination of Project Controls and Program Management fails to recognize two separate and distinct district activities: management (district) reporting and project control. These two activities, while closely interrelated, have different objectives and motives. The danger is that "project control" will lose out to "management reporting" because 1) Caltrans is historically more comfortable as a top-down control organization, and 2) the need and priority to meet immediate management needs. Some districts have complained this kind of emphasis has resulted in more paperwork and less active project control.

On the other hand, funding and the PY allocation process are two areas historically

under the control of Program Management where the Project Manager could be involved in order to accrue more authority.

Some districts have indicated that the project management implementation process is not easy and should be carefully phased to ensure its long term survival. Their reasoning is that, initially, emphasis should be placed on implementing and improving data gathering and reporting systems. Once in place, senior management will be better able to hold the Project Manager accountable. The Project Manager, in turn, will be better motivated to be more pro-active in the project control process to improve his/her ability to respond to senior management. This is an admirable and pragmatic approach to the implementation of project management. It is important, however, to remember the ultimate objectives to avoid getting lost in the process.

A natural tendency in government is to define a nitch and establish turf. To avoid this occurring prematurely, senior management should continually emphasize the ultimate objectives of the project management process. This constant emphasis on objectives will also provide some "light at the end of the tunnel" for those younger employees dissatisfied with the current emphasis on paperwork.

> "Program Management still drives the schedule with PYPSCAN. PYPSCAN, however, has proven to be a poor scheduling and resource tool at times. Hopefully, project management develops to the point where it has more control in these areas."

g. *Has the new project management organizational structure added another managerial layer on top of the old organizational structure?*

Initially, most districts assigned the Project Management role to employees who continued their past responsibilities without adding a new managerial layer. In a few districts, employees were assigned solely to the role of Project Manager but they were generally coordinators who didn't add to the overall managerial layers either.

In the larger districts, the advent of the project management process did force a reexamination of the responsibilities of existing managerial layers and it did appear as if some redundancy existed.

Since the initial reorganization to accommodate project management, the role of the Senior in the Department has been altered to assume direct supervisorial duties which has effectively eliminated the Associate Project Engineer from the managerial layer. And most districts continue to streamline their organizations in other ways to make the best use of project management. (One district has undergone major reorganizations four times in the last two years.)

In most districts, the Project Development Senior is assigned the role of Project

Manager, and he/she reports to a Project Development Deputy. This structure is similar to the pre-project management organization except that the Project Manager now has a greater breadth of responsibility than the previous Senior's role.

A complaint in some districts is that a Senior could be a first-line supervisor, possibly a Functional Manager, and a Project Manager at the same time. This bundling of duties should be carefully monitored to ensure project delivery is not compromised.

h. *Are conflicts between scope, cost, schedule, resource availability, and quality effectively resolved?*

> "I believe that features beneficial to the job such as safety considerations are overlooked when cost and schedule are on the line."
>
> "We are considering a substandard design for construction of a 4-lane project in order to meet the delivery schedule."
>
> "The question should be is it an acceptable level of quality?"
>
> "Quality has suffered only partly due to schedule concerns, however. The lack of knowledgeable staff is also a factor."

Few districts expressed any real difficulty resolving conflicts between cost, schedule or quality. What exactly does this mean? Are Project Managers surfacing critical issues in time to discuss them? Are they being surfaced and resolved as a matter of course without undue senior management involvement?

As better guidelines and standards are developed to govern the project management process, as the availability and demand for resources becomes clearer, and as budgeting concerns become more overriding, more conflicts are likely to arise in the future.

Functional Groups have indicated that while they haven't had any real conflict with the project management process, quality has suffered due to the greater emphasis on cost and schedule delivery issues than in the past. It is not likely that Caltrans standards and specifications are being compromised. What exactly do Functional Groups mean by this statement? Is there less time to produce a given design? Are non-essential frills being eliminated from the ultimate design? If so, that's good and a sign of improved efficiency. Is the final PS&E package incomplete for construction purposes? Is the final design unsafe for motorists? If so, that's bad but more a reflection of ineffective managerial oversight than project management.

> "In our experience, advanced projects have an equal or better quality than on-time projects."

It is clear that Functional Groups, while recognizing the authority of the Project Manager, are not enamored with the process, their new role and reporting responsibilities. They are nonetheless professionals who can be expected to present sound technical reasons for a particular course of action, the consequences if a particular action is not taken, plausible alternatives, and the impacts to project delivery that can be reviewed and resolved by senior management on the basis of merit, funding or priority.

i. *Does the current consulting out selection, administration and amendment process complement the project management process?*

The current consulting out selection and change order approval process in the districts and HQ is too long and burdensome to effectively support project management's needs. The process is deep in inefficiencies, redundancy and misguided procedure. The process is actually contributory to delays in project delivery when the emphasis should be on providing the project with the means to improve it. What is presently a nine month or longer process, should take less than half that time. The change order approval process is only slightly better than the original selection process. Senior management has indicated they are aware of these problems and actively seeking improvements.

On-call consultant service agreements are available to help Functional Groups address peak workloads and to avoid the time-consuming selection process. They are not used as often as they should be with the resultant impact on project delivery. It is not clear why Functional Groups are hesitant to use consultants. Perhaps it has to do with the quality of past work provided by the consultants, added oversight burdens, feeling that they are somehow taking away from work that would otherwise go to Caltrans employees, or lack of managerial support in this direction. While this issue should be investigated in more depth, it is likely to improve as more attention and visibility is given to resource availability and needs.

> "There is great reluctance for Functional Groups to use on-call contracts for fear that would indicate an inability on their part to perform their duties."

> "On-calls tend to be seen by management as a replacement for hiring needed technical staff."

Consultant administration procedures we have seen really need attention. Scope is not initially well defined. The Caltrans process itself hinders reasoned scope changes. Contractual terms and conditions do not adequately address project management's needs for scope, cost and schedule reporting and control programs; deliverable descriptions and timing; meeting participation and frequency; audit capabilities; oversight responsibilities; or change notification and processing. While some districts are better than others, generally consultants are not required to provide quantified progress reports and updated schedules on a routine basis; little verification of consultant provided project status information is evident; and progress meetings, when held, do not critically evaluate performance, identify problem areas, nor mutually seek solutions to retain delivery schedules. As a result the relationship between consultants and Caltrans personnel often becomes emotionally charged to no ones benefit.

The relationship between consultants and Caltrans is often adversarial. Caltrans feels the consultant is out to make the biggest buck possible without regard for quality, and the consultant feels Caltrans is too burdensome, misdirected and inefficient to care about performance. A more appropriate relationship in terms of achieving project goals should strive toward creating an atmosphere of mutual respect and trust, and focused on meeting common objectives as part of the project team.

"Local agencies do a much better job at this!"

"Consultants keep Project Management informed but usually after the fact."

"I don't think we have any control over the consultant's work. Work gets delayed, costs increase, and there is nothing we can do."

"The process is too complicated. By the time all the preparation is done to use an on-call consultant, you could have done the work yourself."

"The consultant selection process is so lengthy, it has contributed to schedule delays!"

"Functional Groups do not have the tools to project their workload and, thus, may be reluctant to utilize on-call consultant contracts."

"Distrust and dislike of consulting out still abounds ✍ the process hasn't been marketed well."

"We must find some way to pre-qualify consulting firms to expedite project delivery. HQ must be made to understand our needs and help expedite delivery."

"Qualified consultants don't even apply for work with the State due to the involved processing time."

4. Systems Issues:

a. *Does project reporting meet the different needs of project, district and HQ management?*

No. Generally, project reporting in all districts at any level is poor. Largely the result of the following:

- Historically poor project charging practices. Actual project activity was not always charged to the project when budgets were exceeded or when "blanket" accounts were available.

- Lack of responsive, timely accounting records. The accounting system does not permit accountability down to the working element. The monthly timesheet process means actual expended data is reported 7 to 8 weeks after the fact. Codes of account need to be reworked – they are numerous, redundant, inconsistent in terms of recognized detail, and do not support current technology.

- Accounting system will not accept changes to correct errant charging practices

- Mainframe PMCS and Trams databases do not permit flexible user-specified reporting, and the turnaround time is poor.

- Not all districts have suitable hardware and software.

"Reporting" generally consists of the "war room" approach which has been adopted by HQ and a few districts that present summary project status information in tabular and graphic formats for management's attention. Project reporting with prioritized PYPSCAN project data is common. Formal Project Status Reports (Revision Sheets) are used by a number of districts to modify PYPSCAN for approved changes in project scope, cost or schedule. A number of reporting formats based on PYPSCAN II have been suggested to report accounting and planned project data. Generally, however, this is an area that needs attention.

"Development of a Work Plan is a start, but we need tools to simplify tracking of schedule changes, cost changes, and expenditure of resources so managers can manage. We need an exception report so upper management can see if a project is in trouble early on – not after the fact."

"What's a Work Plan?"

The following are suggested areas for enhanced reporting:

- Project
  - Progress and performance
    - Original budget
    - Current budget (Scope change control)
    - Forecast (Cost and schedule trends)
    - Cost and PY expenditures by total project and resource group
    - Updated monthly schedule
    - Graphical analysis
  - Near term activities
  - Critical Items
  - Staffing availability against forecast needs over time by resource group
- District
  - Comparative analysis
    - Project status compared to district delivery plan
    - Resource needs against available staffing
    - Productivity ratios: PYs expended by resource group divided by some common denominator such as numbers of drawings produced, dollar value of the improvement, or projected lineal foot of improvement
  - Workload
    - Current and projected workload by Project Manager or geographical area
    - Current and projected workload by resource group compared to actual and projected staffing

- Financial/Funding Status

  - Funding status by project by fiscal year. Should include sources of funding, planned amounts, realized amounts, and critical issues for management's attention.
  - Net return analysis (or cost reduction analysis)

    (Note: Private industry uses a financial analysis to determine a current and forecast net return by project that can be used to compare and prioritize dissimilar projects)

- Exception reporting

  - Near term activities (such as all projects with critical milestones to be attained in the next six months)
  - Potential project deviations from the approved District Delivery Plan

- Productivity ratios

  - Resource PY expenditure by type of project by phase

✂ Headquarters

- Comparative analysis

  - Number and value of actual project delivery as a factor of planned delivery goals.
  - Actual PY expenditure as a factor of the total volume of projects produced.
  - Output per PY by functional group by project type by district
  - Functional group comparisons

- Workload

  - Project cost and schedule status against approved district delivery plans
  - Resource expenditures by type against plan

- Critical issues

  - Project delivery issues
  - Procedural or process related issues (such as the lack of an efficient consultant selection process)
  - Structural issues (such as suggestions concerning an employee classification for project control employees)
  - Requests for assistance to expedite project delivery

b. *What are the minimal necessary reporting requirements?*

The type and extent of project reporting should vary with the intended audience. Managerial levels in the districts and HQ should receive summarized status information complete with recommended actions when necessary. Working levels on the project should receive more detailed information with audit trails to centralized accounting systems.

Generally, project reporting should be the minimal amount needed to address the following issues:

- Project delivery plan approvals
- PY and cost expenditures by organizational element by project
- Project progress and performance against plan
- Resource requirements against available staffing
- Status of funding against plan
- Scope, cost and schedule deviations from plan
- Recovery recommendations for deviations from plan

c. *Is project reporting among districts standardized?*

No. Project reporting in any district is poor. A commonly heard complaint is that Headquarters should concentrate on refining the base accounting and PMCS databases to make them more comprehensive and responsive to district needs, provide the districts with better data extraction tools (such as the Black Box), and improve standardized reporting formats and review procedures.

d. *How effective is PYPSCAN as a budgeting tool? As a project control tool?*

FINDINGS

PYPSCAN appears to be an excellent budgeting tool. It incorporates algorithms by project type to produce good, quick project delivery schedules and PY requirements by project based on Statewide averages. It is the basis for the district delivery plans and PY allocations from HQ. Developed decades ago as a "program" budgeting and control tool, PYPSCAN generated PY budgets hold up remarkably well at the district level. It doesn't hold up so well at the project level where it might be off by a factor of two or more.

> "PYPSCAN is a useful tool but too inaccurate. If we put the manpower into a project that PYPSCAN recommended, we would need twice the number of people we have!"

PYPSCAN is essentially a top-down management system where project resources and schedule are developed by senior management, and project management is expected to conform to them. The emphasis is on delivering large "programs". Because of the lack of emphasis on maximizing "project" delivery, "project" cost and schedule budgets were often overrun without adequate forewarning.

> "There is about a 2+ month delay in updating PYPSCAN information."

> "Our structures liaison agreed to a project-specific time frame but could not get it into PYPSCAN."

> "There are times when you have to lie to the system to get the results you want."

> "PYPSCAN schedules bear little semblance to reality but are followed as much as possible through an inefficient process of crisis management."

Project management is a bottoms-up management system. Given a control budget, the process emphasizes quantitative methods at the project accountability level to surface critical issues while there is still time to take corrective action and perhaps avoid budget overruns. In terms of project control, the project management process is superior because of the organizational commitment, and control tools employed.

> "PYPSCAM (sic) rewards delays and punishes early delivery."

> "PYPSCAN reflects work done ☹ not all the work that should have been done and not in the way it should have been done."

Project management process expedites delivery at the smallest accountable level. Project status is successively summarized for group, office and district accountability.

e. *How can PYPSCAN better serve the needs of district and HQ project management?*

PYPSCAN and project management can co-exist but there are identified conflicts that will have to be attended to first:

- ✂ Project data can differ from that generated by PYPSCAN. PYPSCAN, developed primarily as a budgeting tool, does not always accept commitments that go against pre-established lead times although agreed by the functional units in question on any particular project. There is a pressing need to revise PYPSCAN such that its budgeting value can be retained while permitting project status updates.

- ✂ PYPSCAN, based on statewide averages, is used as the basis for district PY allocations by HQ. While PYPSCAN appears to be adequate for determining total district allocations, PY allocations on any one particular project may be off by as much as a factor of two or more. Project management cannot modify PY requirements to match a given scope of work unless a corresponding PY offset on another project is found. This is usually beyond the control of a single Project Manager and requires district management support to be accomplished.

- ✂ Project management sends project status information to Program Management to update the PMCS database, a central storehouse in HQ for project related data, and to prepare management reports. The PMCS updating process including district reviews can take up to three months from the time they are identified at the project level before they are reflected in the PMCS database. Management reporting from PMCS is not sufficiently flexible or timely to meet project needs.

f. *What additional tools are needed for the districts to be able to effectively evaluate resource needs and availability?*

Each district must be able to realistically plan their project development scope and functional group participation. The following tools would be helpful:

- ✂ PYPSCAN algorithms must be updated to reflect current project PY development needs, especially in the front-end planning phase.

- ✂ A simple process to develop planned project resource needs by functional group should be developed that conforms to PYPSCAN. [Either modify the current PYPSCAN system to be more flexible or employ an add-on program such as the PSCP (PYPSCAN Conversion Program) that permits fast, user friendly reporting from information downloaded directly from HQ PMCS databases.]

- ✂ PMCS must be revised to accept modified PY information from functional

resource groups on specific projects when agreed to by all parties.

- ✂ PMCS must be revised to identify the planned source of PYs to be spent whether from within the district, another district, Central Design, Northern Design, Office of Structures, or consultants.

Once planned type and source of resources have been developed by project management and agreed to by all parties, each district must be able to extract expenditure data from the accounting system to determine whether they are on track with the plan.

- ✂ The accounting systems must be modified to produce expenditure reporting by functional group by project.

- ✂ The accounting system must be modified to produce both PY and cost expenditure data by project by source (including consultants).

g. *Is the scope change control program effective?*

PSR and Project Report requirements have been modified to include more scope definition. While these are steps in the right direction, they do not constitute scope change control; they do not prevent cost surprises at the time of advertisement.

> "The entire programming process is ridiculous when you consider the magnitude of design, environmental, and socio-economic assumptions and considerations to be evaluated. In short, PSR programming is not complete enough to set project schedules and cost."

A scope change control procedure has been developed to help identify scope changes and to obtain approval prior to incorporation into the project. It does not appear that this procedure is being followed to any degree between PA&ED and project advertisement.

A sound scope change control program will identify potential scope changes in sufficient time to avoid them if necessary, evaluate their cost and schedule impact, assess alternative solutions, and obtain managements approval before their incorporation into the project. An effective program would contain the following elements:

- ✂ A scope of work description should be in sufficient detail to be monitored during design evolution. This scope of work should be continually updated as more design definition becomes available.

- ✂ Potential deviations from this scope of work can be identified by any member of the project team, formally documented and sent to the Project Manager (Control Group) to be evaluated for cost and schedule impact.

- ✂ Formal approval to incorporate the scope change into the project can only occur upon written acceptance by the Project Manager, or by the Deputy Manager depending on the magnitude of the change on project delivery.

- ✂ A "Current Budget" is prepared and continually updated to reflect the capital cost of the project incorporating all approved scope changes. This "Current Budget" and related scope definition is the base from which subsequent scope deviations are evaluated.

- ✂ A scope change register is the historical record of the impact of all scope changes approved and incorporated into the project from inception.

A scope change control program is fundamental to the project control process and ensures realistic schedules and cost estimates are prepared. It is essential.

> "Once you have a project budget, the assumption is that you are getting a cost effective improvement if you stay within that budget."
>
> "We could do a better job justifying and evaluating scope changes. Oftentimes we continue with a poor scope in order to meet project delivery."
>
> "When scope changes are evaluated, only construction costs are considered. What about engineering costs?"

h. *What incentives can be introduced to reduce cost and time?*

> "Motivation is a difficult concept in civil service. We are asked to compete with a system full of old ideas and goals. There is a need to incorporate objectives, goals, and business principles used in private industry. We must find a way to encourage and reward excellence, dedication and efficiency."

During the interviews, most Project Managers were innately motivated to expedite project delivery without a lot of external reward or stimulus. They wanted general guidelines and the freedom to exercise their skills within those guidelines. (It should be noted, these Project Managers were generally young and they hadn't been frustrated over the years by events they couldn't control.)

Some (albeit a minority) were motivated (negatively) to expedite project delivery to avoid HQ's "black marks". (This is not considered desirable. Others were actually motivated to delay reporting inevitable schedule slippage to avoid the "wrath of HQ".)

Besides permitting Project Managers sufficient leeway to exercise their skills, these additional incentives might be considered:

- Maintain an historical record of project cost and schedule delivery changes and note which are "controllable" by the Project Manager.
  - A Scope Change Control Register should include a detailed description of all approved scope changes, cost and schedule impacts, and reasons for incorporation into the project.
  - A Project Delivery Register should contain all cost and schedule changes to planned project delivery, reasons for the change, agency responsible for the change, and an indication whether the change was "controllable" by the Project Manager.
- Recognition among peers for a job well done. (A job well done is not necessarily a job delivered within plan. It is the sustained quality of effort spent to expedite "controllable" elements of project delivery.)
- Attendance and acknowledgement at the ribbon-cutting ceremonies.
- Management recognition of the Project Manager position either by enforced rotation, or evidenced career advancement.
- Incorporate a process or group in the district and at HQ to receive and act on suggestions from the Project Managers (or anyone for that matter) for improvements to the delivery process. Most feel their concerns fall on "deaf ears". Such organizational energy and talent should be stimulated not stifled.

"Comments given to management seem to often be ignored and nothing happens. So after awhile morale gets low and nobody cares anymore."

i. *How can cost and schedule estimating techniques be improved?*

Formal estimates are prepared at PSR/PSSR, PA&ED and at advertisement. Generally, scope definition at PA&ED is not in sufficient detail to be monitored during detailed design (between PA&ED and Advertisement). Scope changes that occur during this period are, therefore, not well documented. Caltrans should require better scope definition at PA&ED, enforce the implementation of a formal scope change control program on each project, and insist that each potential scope change be evaluated for cost and schedule impact prior to approval by a Project Manager.

The Project Control Group should be utilized to standardize the approaches and formats

used to prepare project estimates to assist or advise the Project Manager.
All estimates should consider the impact on engineering, construction and maintenance. All potential slippage in the advertisement date should consider the impact on construction.

Feedback should be available on average design costs by employee classification, recent construction awards, and future escalation rates by year by commodity to facilitate the estimating process.

The standard BEEs estimate code of account, unit descriptions, units, and unit rates should be available on floppy disk to facilitate the estimating process.

5. Staff Issues:

a. *What methods are available for rewarding teamwork versus individual performance?*

This issue was not investigated in any depth. There was isolated criticism, however, of awards to district management for successful staff activity. In this particular case, the award was not filtered down to staff and they were, if anything, reverse-motivated.

If there isn't already some mechanism, senior management should consider some employee recognition program whereby a Project Manager can recognize a team player or a group of players for outstanding achievement. The recipient(s) could receive some monetary reward, memento, picture and/or mention in a monthly newsletter.

b. *What are the appropriate employee classifications for Project Managers?*

The general consensus among all districts is that the Senior is the appropriate level for a Project Manager. One district has assigned the Supervising TE as the Project Manager and another the Associate level. As the first line supervisor, the Senior is closest to the work and, therefore, best able to monitor and control events. The number of projects a Senior is responsible for is generally a manageable 6 to 10.

In most districts, Functional Managers are Seniors which gives parity to the Functional/Project Manager relationship. (In the one district that had assigned Sup TEs as PMs, the Functional Managers were also Sup TEs.)

In Caltrans, the Project Manager will always be limited in terms of assigned authority and responsibility when compared with private industry. A Project Manager in Caltrans is really a "facilitator". To be proficient in this role takes some understanding of the process and, more importantly, requires an inquisitive spirit and energy that enjoys confronting and overcoming difficulties. Not all Seniors, or Supervising TEs for that matter, have sufficient experience, personality or stamina for the role. Senior

management must be careful to appoint "qualified" employees as Project Managers from whatever employee classification level.

c. *What are the criteria for staffing the Control Units?*

Control Unit personnel should have some proclivity and discipline for handling numbers, and performing statistical analyses. Computer capability is recommended. He/she should possess a good knowledge of the entire Caltrans planning and design project development process. A prior knowledge of the activities required to monitor and control project progress and performance is a plus. Prior experience with a private design/contracting firm or in consultant administration is a plus. He/she should be a good communicator, self-motivating and inquisitive.

Like Project Managers, a Control Unit employee should have a good design background to appreciate the complexities and concerns of project development. Not all designers make good Control Unit employees, however. A well-motivated non-designer is preferable to a ill-motivated designer.

d. *What is the career progression for Project Managers? For Control Unit employees?*

Most districts felt Project Managers should come from design development backgrounds to mirror the bulk of project development activity. Generally, most districts felt the career path for senior management was through the Project Manager position. In the past, design Seniors were in charge of design squads and they advanced through the Supervising TE level as either a Branch Manager or Deputy. That progression remains basically the same under project management although the "Project Manager" Senior is probably more prepared for the advancement than the "Design" Senior was in the past.

Besides senior management commitment to supporting the succession, most felt that the general breadth and focus of the position was such that the individual who performs the Project Manager role is better able to field the kind of questions asked in advancement interviews.

> "High turnover in Project Control is due to the lack of promotional opportunities."

The source of, and career potential for, Control Unit employees is not so clear. Most districts simply appointed Control Unit employees from a number of sources to initially staff the Control Unit without much thought to employee background or motivation. Even now, two years later, not many districts have given much thought to long term staffing requirements. The standard Caltrans rotation program means that no employee will stay in the Control Unit for any length of time. This means the Unit will be in a constant state of training and probably limited in terms of eventual capability.

One district is toying with making the Control Unit a permanent stop in the rotation program for new employees. Another is considering making the Control Unit a recommended path to Project Manager. Generally, though, there is no career advantage to a stint in Project Controls at the present time.

While Control Unit employees generally come from design backgrounds, the position is not one that most pure design engineers aspire to. As a result, many Control Unit employees were (are) not well-motivated or the best-suited for the position.

Private industry provides an avenue (career path) for employees who enjoy the project controls field. They, in fact, permit specialization in cost, schedule, or estimating disciplines if desired by the employee. Some of these controls personnel have design backgrounds, some have PEs. These attributes, while nice, are not necessary for advancement. Some employees chose to remain with Controls for their entire careers, others opt to go into project management or construction with a solid Controls background which only makes them that much more effective. Caltrans ought to consider providing a similar opportunity for employees who wish to concentrate in these areas. The Project Controls field is an accepted discipline in the industry with its own professional organizations and challenges.

e. *Is the functional employee fulfilled in a project management environment?*

At the present time, the functional employee has not been greatly affected by the project management process. The functional group operates much as it always has in support of project development. Some districts involve functional groups in the project planning phases to a greater degree than in the past but this is not the norm.
Functional groups provide an employee the opportunity to plan and organize a career around a specialized activity. This aspect of functional support is not affected by project management.

Eventually, as a result of the project management process, the functional employee should have more opportunity to participate:

- ✂ as a project "team" member jointly striving for project delivery to obtain the best quality design for the least cost and schedule
- ✂ in individual project planning activities to ensure needed activities are anticipated, and balanced where feasible to acknowledge limited resources
- ✂ in developing better information with which to forecast and plan for upcoming work

f. *How can Caltrans continue to attract and maintain a technically strong workforce in a project management environment?*

The increasingly declining number of civil engineering graduates nation-wide would be a problem with or without project management. If the project management process results in more efficiencies in project development and more respect for employee contributions, it can, in fact, only improve Caltrans' ability to attract and hold qualified personnel.

Functional technical groups are retained under the project management process. Under the project management matrix organization, project delivery issues of cost and schedule are given equal weight with functional issues of quality. The ensuing dialogue should force a reassessment of critical project issues and more "value engineering" to occur which can only help to strengthen the functional role in project development.

g. *When selecting Project Managers, how do you match talent to the job?*

The project development process is complex with many influences on ultimate delivery many of which are beyond Caltrans' control. The project management process is further constrained by Caltrans' structural and process procedures. It is important to assign Project Managers who aren't jaded by the process, who still retain the enthusiasm to pursue seemingly unattainable goals, who remain inquiring, and who continue to ask the difficult questions: when?, why?, where?, how?, how long? and how much? In the Caltrans process, these attributes are probably more important than managerial or administrative ability.

Does Caltrans have the luxury of matching these attributes with the position? Probably not to any great degree. But Caltrans can acknowledge good performance among peers in the hopes that such behavior will rub off on others.

h. *Does the typical employee need guidance and support to effectively exist in a matrix organization?*

Yes. The matrix organization requires an employee to respond to two supervisors: a Functional Manager (staff) and a Project Manager (line). This is not always easy nor is it intuitive. It is a relationship that can result in conflicts. Everyone should be focused on a common goal: project delivery. Old allegiances should not be a consideration. The employee should not be expected to resolve these issues him/herself, but should be given the means to resolve these conflicts within the organization. A formal process should be established whereby senior management routinely addresses matters of personality, resources and priority.

The old functional organization resulted in quality products and served to build employee self-esteem on the basis of quality attained often at the expense of cost and schedule. In today's environment, cost and schedule are unavoidable concerns. Under the functional

organization and mind-set, conflicts are numerous and inevitable. The project management process forces everyone to focus on project delivery issues and not on their own piece of the action. Conflicts are minimized as everyone selflessly adjusts their own priorities to meet common project goals. This change in mind-set must be constantly reinforced by senior management until it becomes second nature in all employees.

An employee support function should also be established to field employee complaints and concerns. A common complaint voiced in many of the districts, is that no one listens to employee suggestions or concerns. These concerns can be addressed publicly or in an employee newsletter.

6. Skill Issues:

a. *What knowledge and skills does a Project Manager need to be effective?*

As mentioned earlier, a Project Manager must be enthusiastic, inquisitive, self-motivating, organized and tactful. He/she must possess a solid understanding of the project development process, the activities that comprise the process, their interrelationships, float and timing. He/she must know the key personnel in the process, and be familiar with standard processing procedures within Caltrans.

b. *What are the training and development needs of Project Managers and how can Caltrans effectively meet these needs? Of Controls Unit employees?*

> "Project Managers need training in what a Project Manager is, what they do, how they do it, and what tools are available to help."
>
> "I haven't been to any training for over five years. Which is probably OK."
>
> "Project management software is not friendly."

The Project Manager Academy received almost unanimous endorsement from all districts. They appreciated the support from HQ and suggested the Academy be expanded to include more information on the planning phase of project development.

The following additional Academies and Forums might be considered by HQ as well:

- ✂ Project Manager Academy

  Continuation of the already successful Academy with an expanded curriculum. The Academy should serve to bolster Project Managers efforts, exhibit management support, and improve knowledge base of Project Managers so that they can be that much more effective.

- ✂ Project Controls Academy

  A more formal Project Controls meeting along the lines of the Project Manager Academy. Like the Project Manager Academy, efforts should focus on presenting reasoned overviews of control procedures and methods to improve the ability of the Project Control Unit to effectively support projects and district management.

- ✂ Project Managers Forum

  This Forum should be a sharing of ideas and experiences of Project Managers throughout the State ✍ a "lessons learned" forum. While the Academy is focused on presenting material to make the Project Manager more successful, the Forum is an outlet for Project Managers to vent their frustrations and flaunt their successes. The discussion should be minuted. Where feasible, action items should be assigned to investigate ways to improve project delivery by suggesting changes to standard personnel policy, eliminating redundant reviews, or supporting favorable legislation, for example.

- ✂ Project Controls Forum

  Like the Project Managers Forum, this Forum should be a sharing of experiences from all Project Control Units throughout the State. This Forum should concentrate on identifying common concerns and operating constraints faced by the Control Units, and investigating various solutions. This Forum could result in modifications to the Project Controls Academy curriculum, improvements to standard Caltrans operating policy, or revisions to standard Control Unit policy and procedure.

As computer expertise grows throughout the State, HQ should present overviews of software or techniques that address specific concerns or work activities in the appropriate Academies for consideration by each district.

The training programs in each district should provide more in-depth and continuous coverage of software and techniques that improve and maintain the ability of Project Managers and Control Units to operate more effectively. The districts' efforts should complement and build on the information presented, and results derived from, HQ's

Academies and Forums.

In addition, HQ should take the lead in developing Caltrans specific software that has common application throughout the State. Updating the validity of PYPSCAN formulas, improving the content and responsiveness of the PMCS database, improving the responsiveness of accounting systems and the districts' ability to access this information are typical examples.

> "Functional Managers should be included in project management training so we can better cope with y'all."
>
> "A forum would be a good idea. But only if Project Managers are given the authority to implement what they collectively agree are good and necessary changes."

c. *What hardware and software tools are being used to monitor project progress and performance?*

Generally, most districts are using a melange of hardware and software to accomplish project control. Below are a few of the software packages identified:

✂ Scheduling Software

Primavera
Microsoft Project for Windows
Timeline for Windows
Suretrack

✂ Spreadsheet Software

Excel
Quatro Pro
Lotus

✂ Database Software

FoxPro
dBase
Paradox
Q&A

✂ Wordprocessor Software

WordPerfect
Word

AmiPro

It is not necessary that all software in all districts be standardized. Within each of the categories mentioned, most software is compatible with each other. What is important is that some software is being used with some consistency.

Primavera is a case in point. It is costly, complex and comprehensive. It is so difficult to learn (and maintain one's ability), that some Project Managers have been turned off scheduling software altogether. A more user-friendly scheduling product like Microsoft Project, or user-friendly database such as Q&A, that people use is far more effective "control" tool than a more able software never used. "The right tool for the right job."

Hardware appears to be another problem. There is a shortage of needed equipment in sufficient configuration. Because more and more software maintains a graphical user interface, a 386 is a minimum configuration recommended for a PC. A 486 is actually cheaper in the marketplace at the present time.

Most districts complain that problems encountered acquiring needed hardware and software have more to do with Caltrans procurement process and procedures than knowing what to buy. The Caltrans procurement process is neither responsive nor timely. It has grown too bureaucratic. It is time the entire process was reexamined for compliance with basic intent. Once HQ has approved appropriations for equipment purchases at the beginning of the year, why not leave it up to the districts to purchase what they need within the approved allotment by their own methods so long as they adhere to general procurement regulations such as requiring a minimum of three bidders, or specified approval authorities, or avoiding firms that do business with South Africa, for example?

Project reporting is almost non-existent. This condition is probably more the result of "inaccessible" HQ mainframe PMCS and accounting information than anything else. As each districts' ability to extract this information improves via improved databases, downloading procedures, or "Black Boxes", project and functional group cost and PY status reporting should improve. HQ should concentrate on developing suggested formats for project progress reporting, comparative analyses, productivity ratios, and management exception reporting.

d. *How effective is "project control"?*

Project "control" does not exist at the present time. Project "control" will exist when deviations from plan are known in sufficient time to be able to do something about them. Project "Control" is knowing that the cliff is ahead; not that you have already fallen off.

For Caltrans to have project "control", the following control elements must be improved:

- ✂ Budgeting process to ensure all project participants and elements are included at reasonable productivity and production rates.
- ✂ The budget and schedule are developed in sufficient detail to be monitored during design.
- ✂ Scope change control process is improved to be able to identify potential scope changes, evaluate each change for cost and schedule impact, and obtain management approval before incorporation.
- ✂ Quantitative control tools, methods and procedures used in private industry (such as a quantified approach to evaluating engineering progress and performance) are employed to monitor work performed against a pre-defined budget.
- ✂ Critical items and recommended actions are surfaced for managements attention in time to take corrective measures.
- ✂ Project status meetings are held routinely with all affected parties to discuss project progress, performance, critical issues and future activities.
- ✂ Charging practices must be improved so that actual time spent is charged where the effort is expended regardless of budget or ulterior motive.
- ✂ The accounting systems and codes of account must be made more responsive to projects' needs to be able to compare actual PY and cost expenditures against a pre-defined project budget by detailed working element, and to collect and analyze historical expenditures for future trends.
- ✂ Project reporting must be more substantive, timely and responsive to management's needs

Project "control" also requires some authority to affect the course of the project. While Caltrans is limited in terms of "empowerment", it can identify and raise contentious issues in time for management to take corrective action. District and HQ management is then obligated to react in a timely fashion for "control" to exist or they or the system should be held accountable.

7. **Style Issues:**

a. *What is the appropriate project management style ✍ decentralized management or micro-management?*

If Project Managers are to be accountable for their actions, if they are to be effective over the long term, they must have the freedom to exercise their will. Caltrans should investigate every opportunity to increase the Project Managers authority.

Additional areas of responsibility for Project Managers might include a role in distribution of PYs within the district, more ability to approve cost and schedule changes, or more autonomy in developing scope of services for consultant assistance.

b. *To what extent should HQ trust and empower districts to manage projects?*

Just as with the Project Manager, the more responsibility given to each district, the more responsible they will become. Based on district complaints, HQ should consider loosening the reins in the procurement, consulting out, and resource allocation processes. HQ should concentrate more on defining broad limits to govern district activity than actually micro-administering these operational processes.

> "District management and/or HQ personnel have changed project schedules without a 'buy-in' from the Project Manager."
>
> "Headquarters is reluctant to accept all district split and combine project schedules. Its not the district's methods that need changing, but rather Headquarters archaic bookkeeping methods."
>
> "There seems to be an untrusting attitude towards the district and an unwillingness to realize that the districts provide the delivery of the program, not HQ."
>
> "Give the districts the authority to be 'Regional Transportation Management Agencies'."
>
> "I see Headquarters in a role of offering experts/troubleshooters to the districts to lend assistance with problems or to offer training."
>
> "HQ review is helpful 25% of the time otherwise it is bureaucratic and time wasting. It should be available upon request. (This assumes district staff had the sense to know when to request help.)"
>
> "If local agencies can do their own advertising, why can't the districts?"

"Too much duplication between HQ and the districts. Give the districts the resources to do the work and hold them accountable."

"Seems like every time the district is given more authority, HQs wants to monitor us in greater detail."

c. *Should the focus be on the Project Manager or the "Team"?*

They are not mutually exclusive concepts. The project management process requires responsibility, authority and accountability to reside in one person - the Project Manager. He/she presides over a project team, each member of which is responsible and accountable and has the authority to perform their particular piece of the action. The entire "Project Team" should be focused on, and motivated to achieve, project delivery. The Project Manager is not an autocratic leader, he is, even in private practice, more an enlightened facilitator.

d. *How can teamwork be enhanced and conflict minimized?*

As discussed, the project management process requires teamwork to be effective. It holds individuals accountable for their actions. It focuses on identifying conflicts early in the project development process so that they can be avoided if at all possible. It is a pro-active process. It welcomes challenge and seeks reasonable solutions. The process itself seeks out conflict and strives to minimize it.

Conflict in implementing the process is unavoidable. Cultural and procedural rules, regulations and guidelines have been developed over the years to support the functional way of operating ✍ focused on delivering a program rather than a project. The project management process, while conceptually simple, has far reaching implications for Caltrans. Implementation will take years and it will not be easy. Conflict during this implementation phase can be minimized by constant management support and reinforcement. Areas to emphasize are:

- ✂ Managerial commitment to improve the structural and procedural barriers to the project management process
- ✂ Rewarding successful team performance
- ✂ Insisting on close functional group and design squad participation in the project planning process
- ✂ Improving the project reporting capability to buttress accountability

"KEEP IT SIMPLE OR FORGET IT."

FINDINGS

QUESTIONNAIRE RESULTS

FINDINGS

MINUTES FROM DISTRICT INTERVIEWS